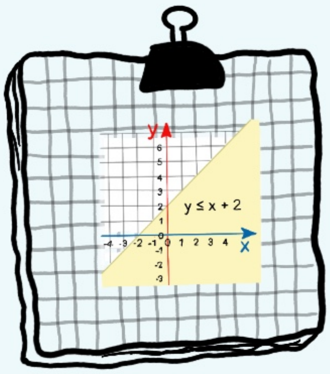
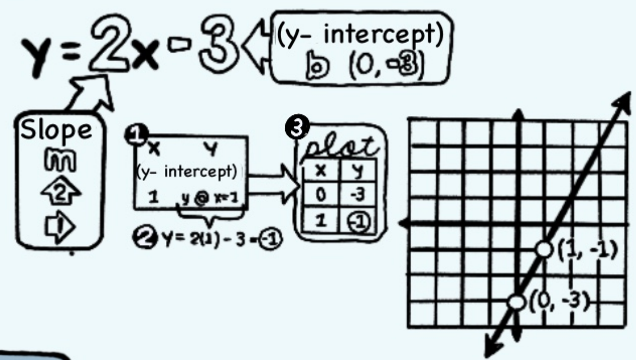
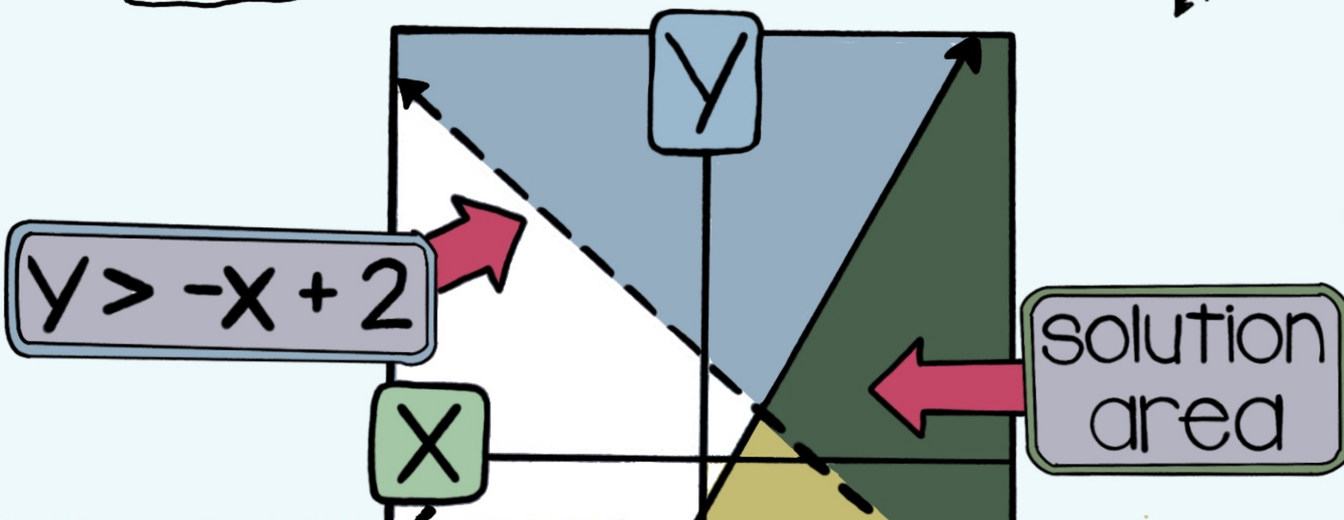
The Maths Society

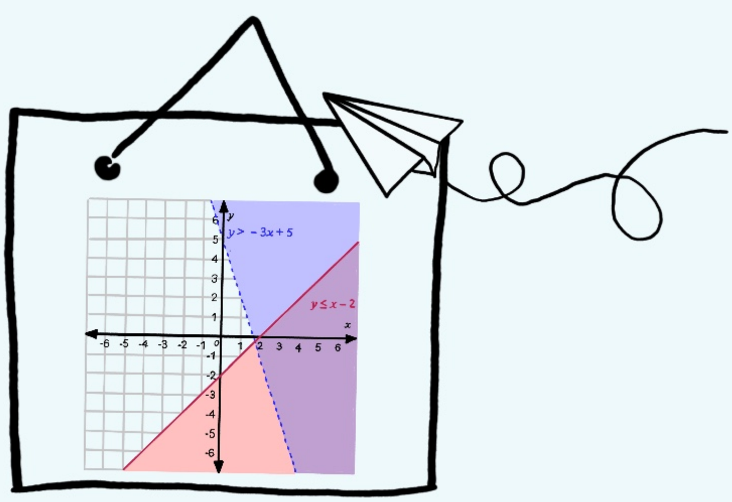
Equations

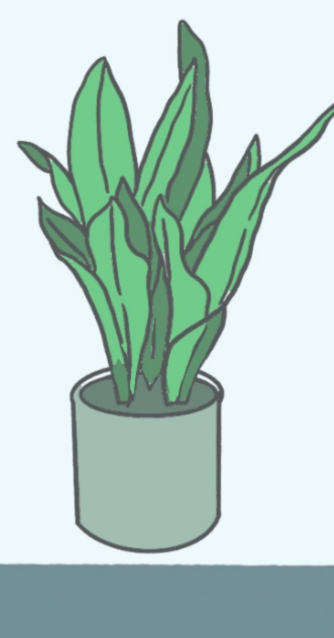




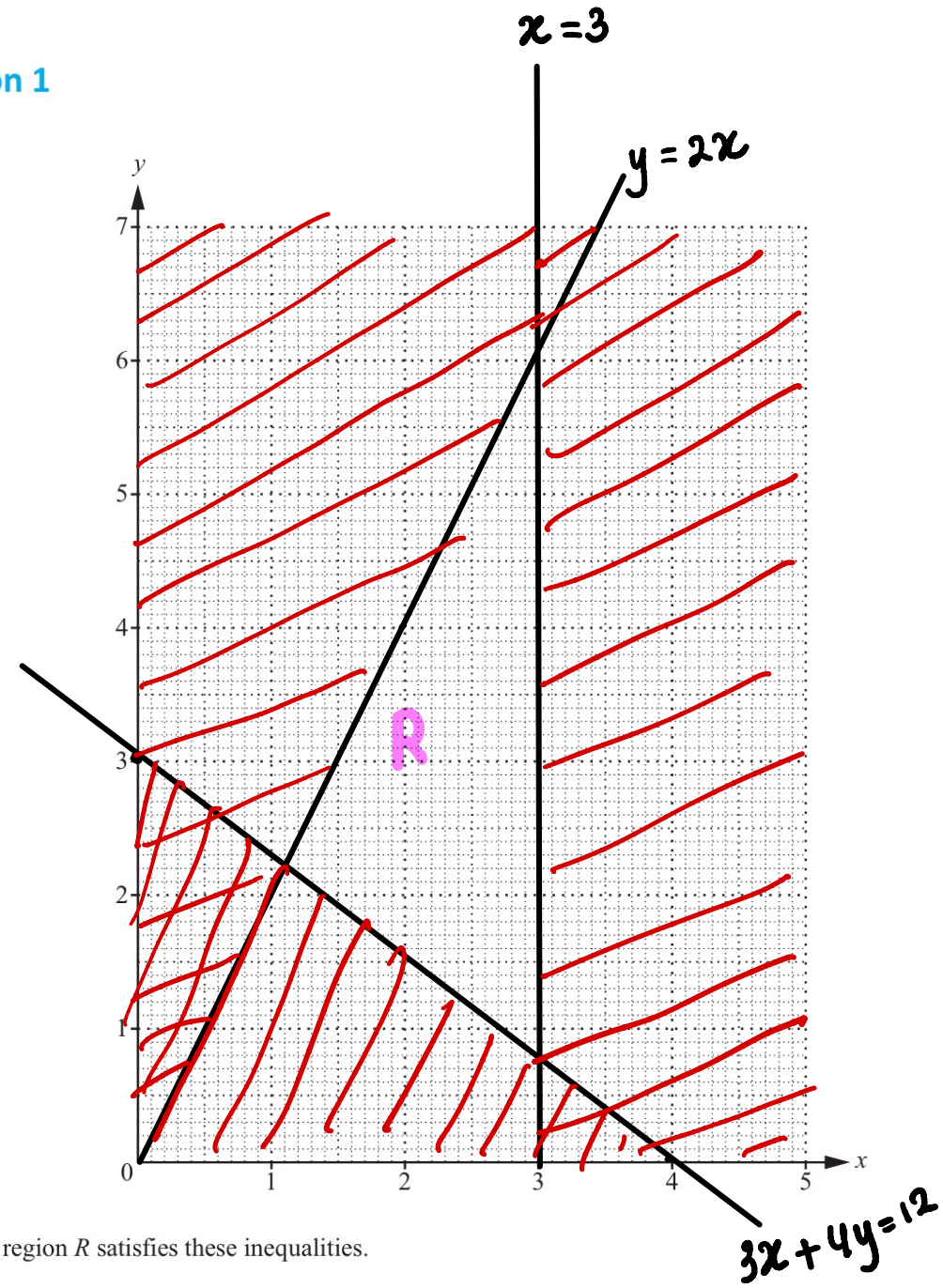
Graphical Inequalities







Question 1



The region R satisfies these inequalities.

$y \leqslant 2x$ $\quad$ $3x + 4y \geqslant 12$ $\quad$ $x \leqslant 3$

On the grid, draw and label the region R that satisfies these inequalities.
Shade the **unwanted** regions. [5]

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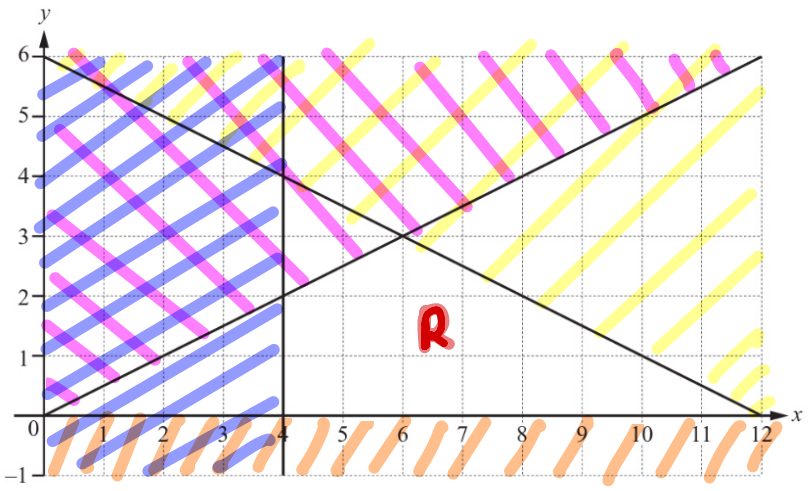
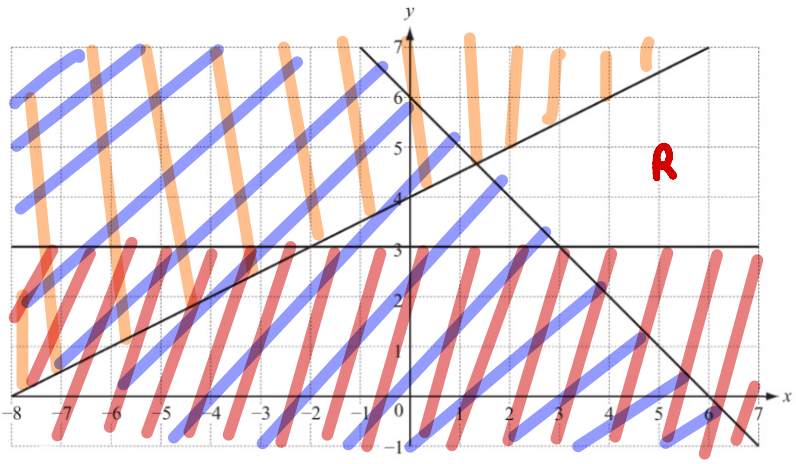
Question 2



By shading the **unwanted** regions of the grid, find and label the region R which satisfies the following four inequalities.

$y \geqslant 0$ $x \geqslant 4$ $2y \leqslant x$ $2y + x \leqslant 12$ [3]

Question 3



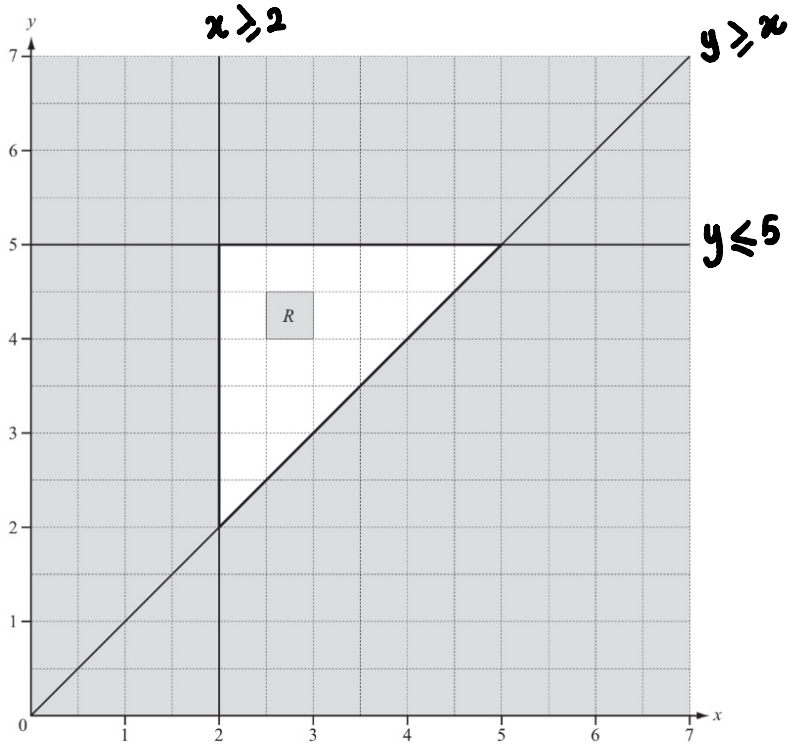
The region ***R*** contains points which satisfy the inequalities

$$y \leqslant \frac{1}{2}x + 4, \quad y \geqslant 3 \quad \text{and} \quad x + y \geqslant 6.$$

On the grid, label with the letter ***R*** the region which satisfies these inequalities.

You must shade the **unwanted** regions. [3]

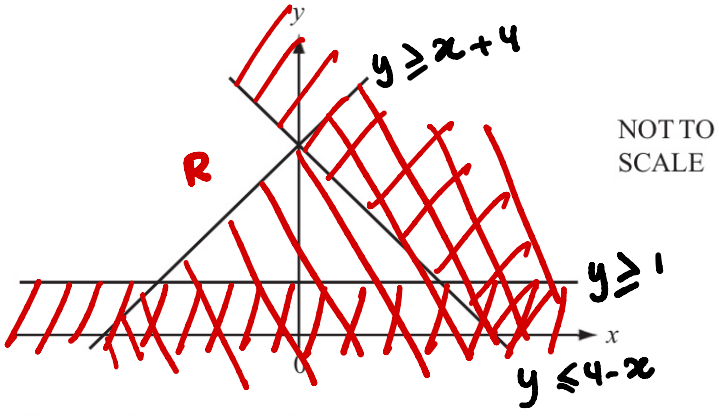
Question 4



The region R is bounded by three lines.

Write down the three inequalities which define the region R. [4]

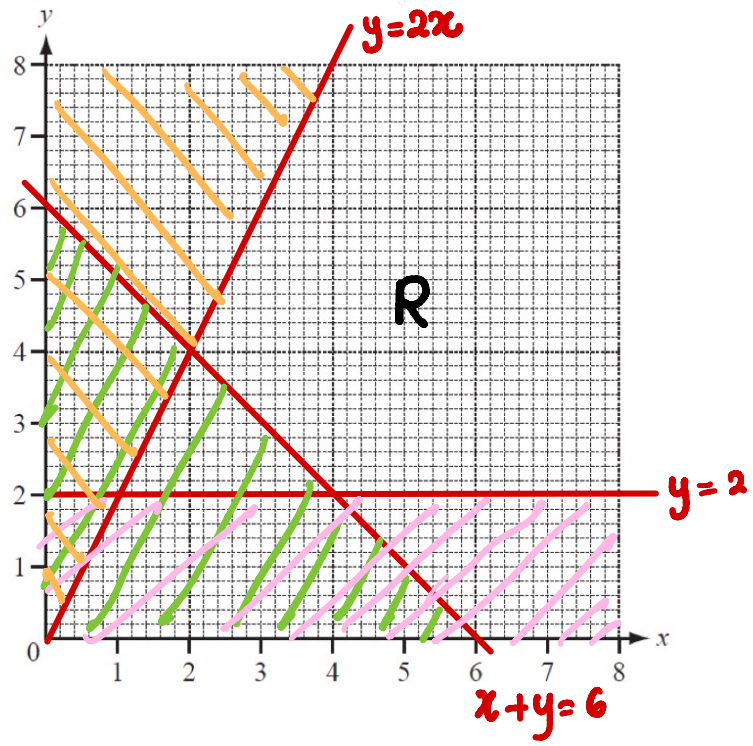
Question 5



The diagram shows the lines $y = 1$, $y = x + 4$ and $y = 4 - x$.

On the diagram, **label the region R** where $y \geqslant 1$, $y \geqslant x + 4$ and $y \leqslant 4 - x$. [3]

Question 6



(a) Draw the lines $y = 2$, $x + y = 6$ and $y = 2x$ on the grid above. [4]

(b) Label the region R which satisfies the three inequalities

$x + y \geqslant 6$, $y \geqslant 2$ and $y \leqslant 2x$. [1]

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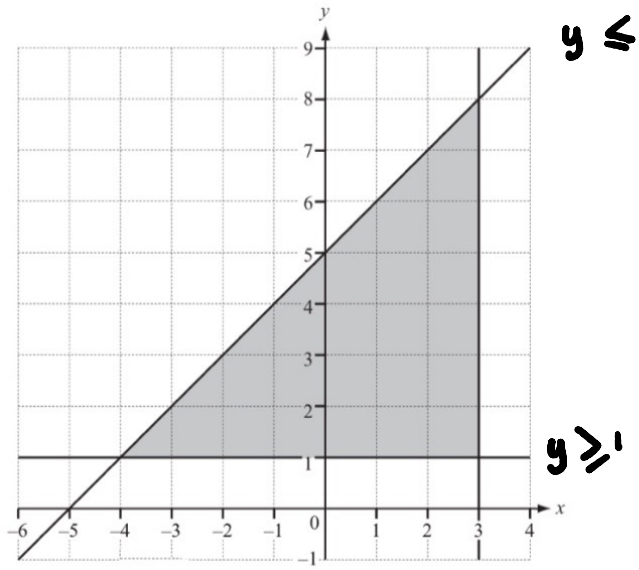
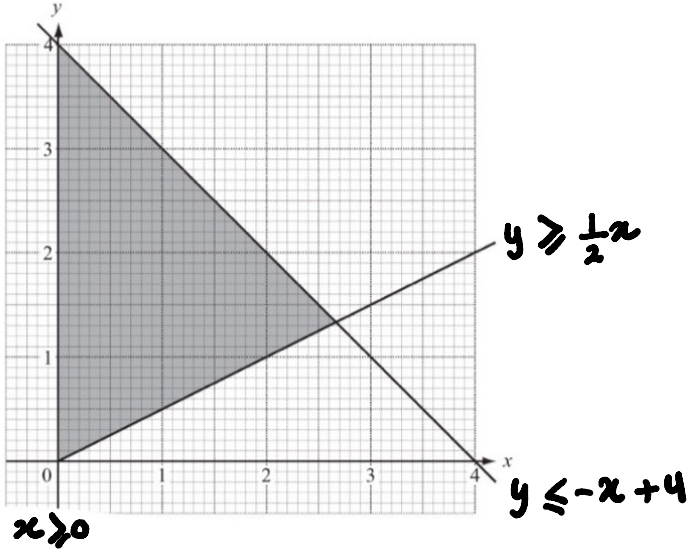
Question 7



Find the three inequalities which define the shaded triangle in the diagram. [5]

Question 1



Find the three inequalities which define the shaded region on the grid. [5]

Question 2

A new school has x day students and y boarding students.

The fees for a day student are \$600 a term.
The fees for a boarding student are \$1200 a term.
The school needs at least \$720 000 a term.

(a) Show that this information can be written as $x + 2y \geqslant 1200$. [1]

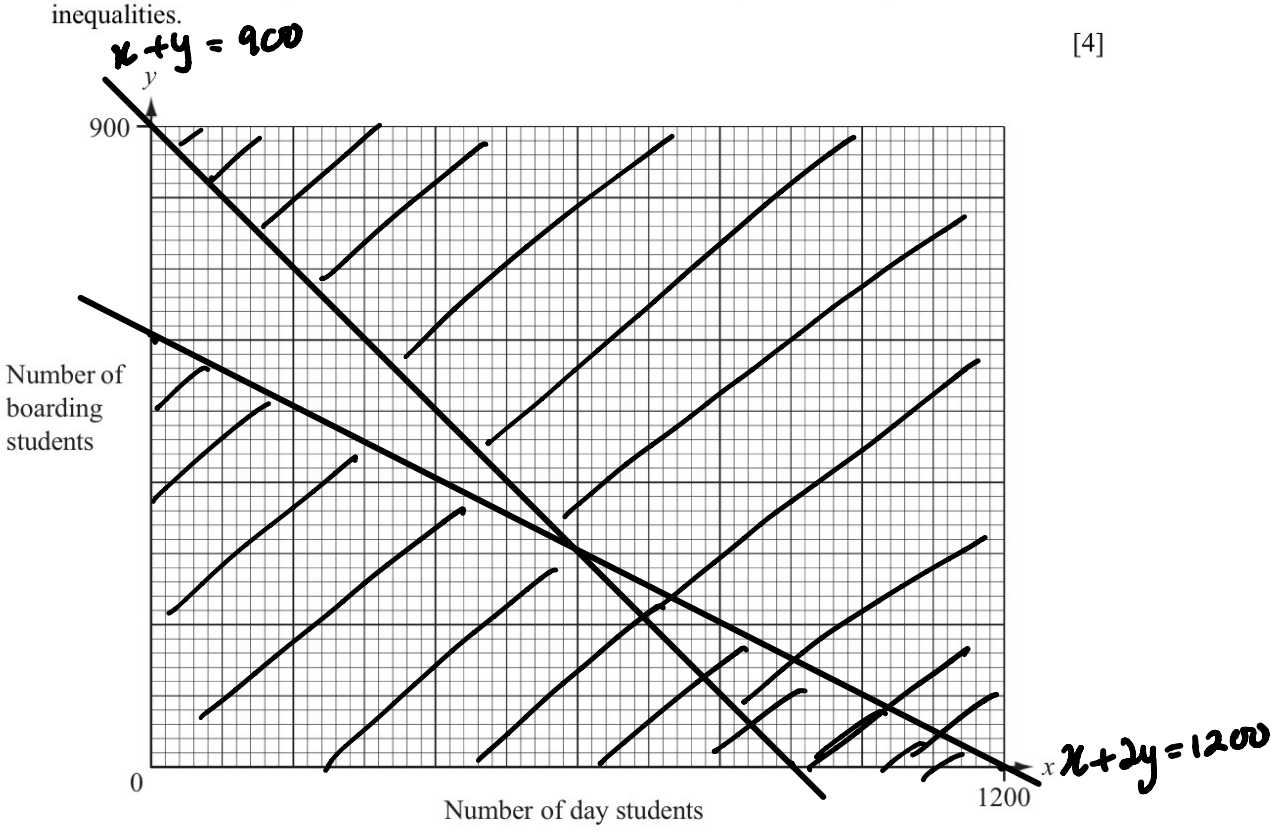
$600x + 1200y \geqslant 720000$

$x + 2y \geqslant 1200$

(b) The school has a maximum of 900 students.
Write down an inequality in x and y to show this information. [1]

$x + y \leqslant 900$

(c) Draw two lines on the grid below and write the letter **R** in the region which represents these two inequalities. [4]



(d) What is the least number of **boarding** students at the school? [1]

300

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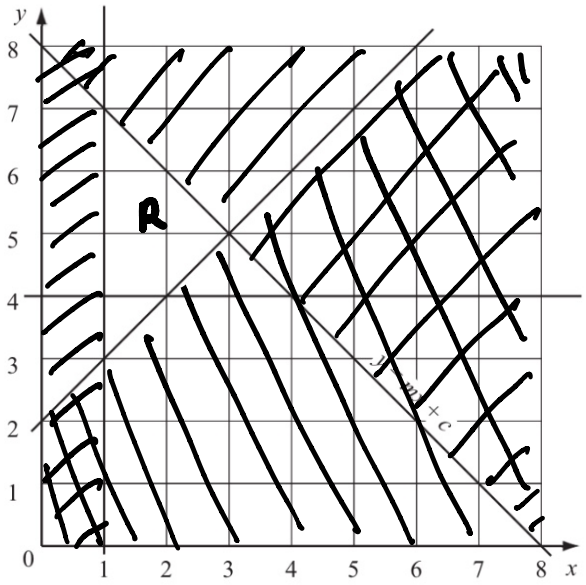
Question 3



(a) One of the lines in the diagram is labelled $y = mx + c$.
Find the values of m and c. [1]

$m = -1$

$c = 8$ [1]

(b) Show, by shading all the **unwanted** regions on the diagram, the region defined by the inequalities

$$x \geqslant 1, \quad y \leqslant mx + c, \quad y \geqslant x+2 \quad \text{and} \quad y \geqslant 4.$$

Write the letter **R** in the region required. [2]

Question 4

A ferry has a deck area of 3600 m^2 for parking cars and trucks. Each car takes up 20 m^2 of deck area and each truck takes up 80 m^2. On one trip, the ferry carries x cars and y trucks.

(a) Show that this information leads to the inequality $x + 4y \leq 180$. [2]

$20x + 80y \leq 3600$

$x + 4y \leq 180$ (shown)

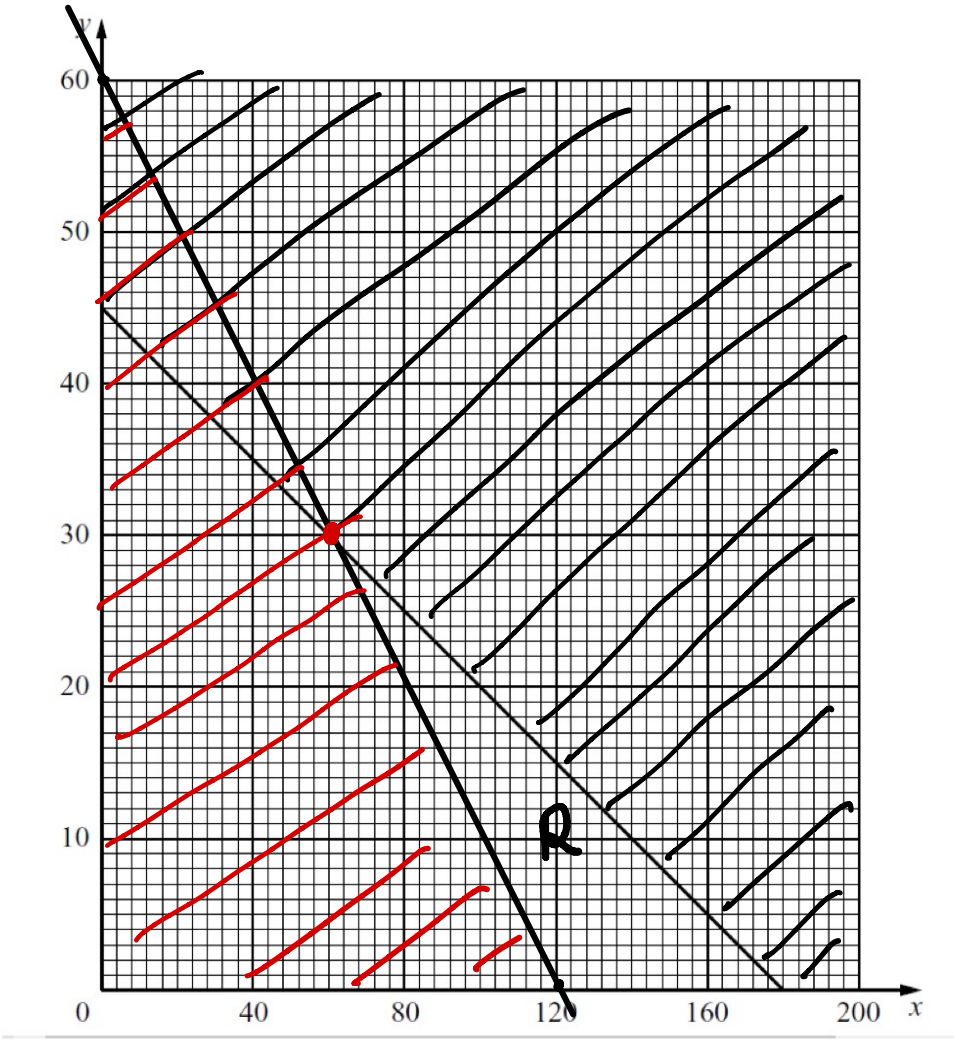
(b) The charge for the trip is \$25 for a car and \$50 for a truck.
The total amount of money taken is \$3000.
Write down an equation to represent this information and simplify it. [2]

$\$25x + \$50y \geqslant \$3000$

$x + 2y \geqslant 120$

(c) The line $x + 4y = 180$ is drawn on the grid below.

(i) Draw, on the grid, the graph of your equation in part **(b)**. [1]



(ii)

Write down a possible number of cars and a possible number of trucks on the trip, which together satisfy both conditions.

(60, 30) [1]

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Question 5

Marina goes to the shop to buy loaves of bread and cakes.
One loaf of bread costs 60 cents and one cake costs 80 cents.
She buys x loaves of bread and y cakes.

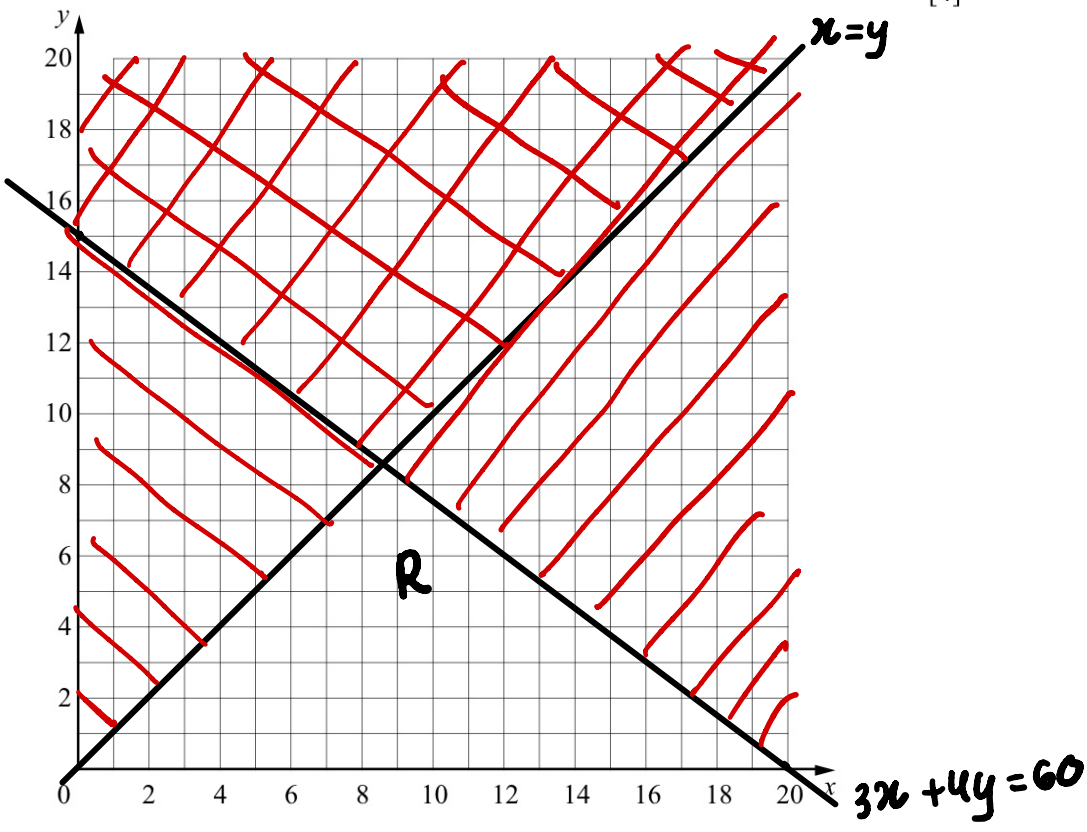
(a) She must not spend more than \$12.
Show that $3x + 4y \leq 60$. [1]

$60x + 80y \leq 1200$
$\div 10$ $6x + 8y \leq 120$
$\div 2$ $3x + 4y \leq 60$

(b) The number of loaves of bread must be greater than or equal to the number of cakes.
Write down an inequality in x and y to show this information. [1]

$x \geqslant y$

(c) On the grid below show the two inequalities by shading the **unwanted** regions.
Write R in the required region. [4]



(d) The **total** number of loaves of bread and cakes is $x + y$.
Find the largest possible value of $x + y$. [1]

$x + y = 18 + 1 = 19$

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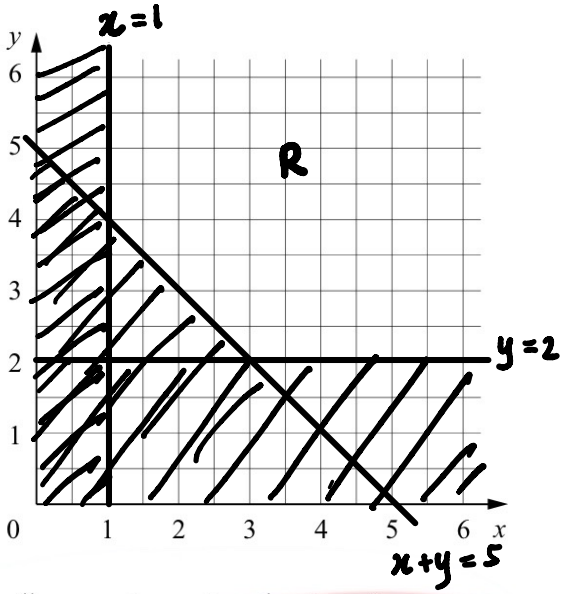
Question 6



(a) On the grid, draw the lines $x = 1$, $y = 2$ and $x + y = 5$. [3]

(b) Write R in the region where $x \geqslant 1$, $y \geqslant 2$ and $x + y \geqslant 5$. [1]

Question 1

In one week, Neha spends x hours cooking and y hours cleaning.
The time she spends cleaning is at least equal to the time she spends cooking.
This can be written as $y \geqslant x$.

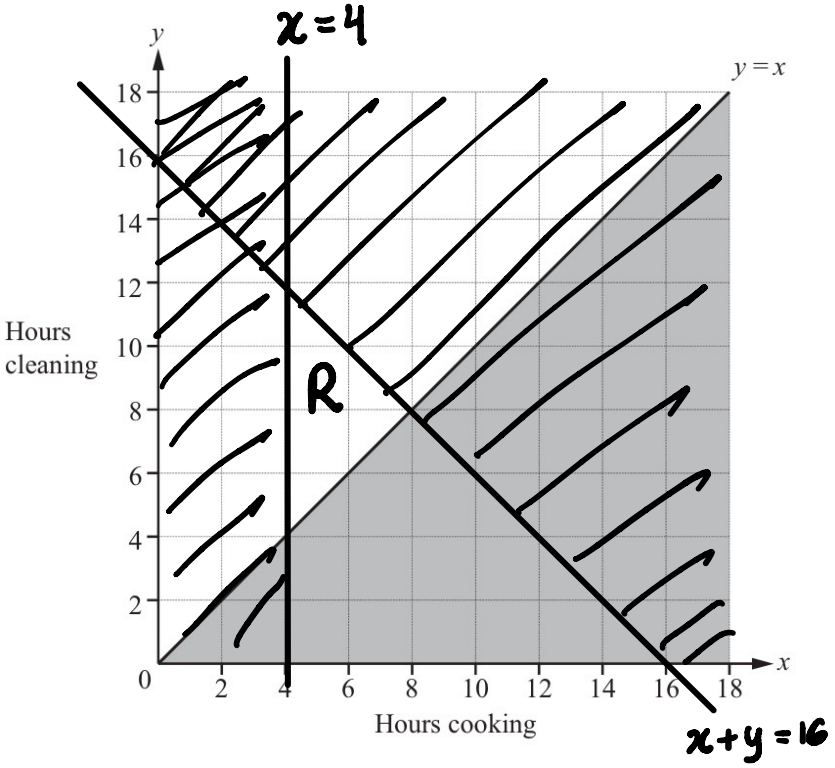
She spends no more than 16 hours in total cooking and cleaning.
She spends at least 4 hours cooking.

(a) Write down two more inequalities in x and/or y to show this information. [2]

$x + y \leq 16$

$x \geqslant 4$

(b) Complete the diagram to show the three inequalities.
Shade the **unwanted** regions. [3]



(c) Neha receives \$10 for each hour she spends cooking and \$8 for each hour she spends cleaning.

Work out the largest amount she could receive. [2]

(8,8)

$10x + 8y$

$= 80 + 64$

$= \$144$

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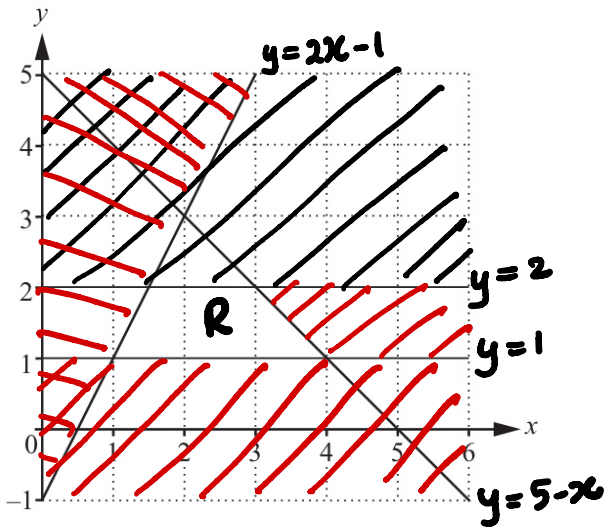
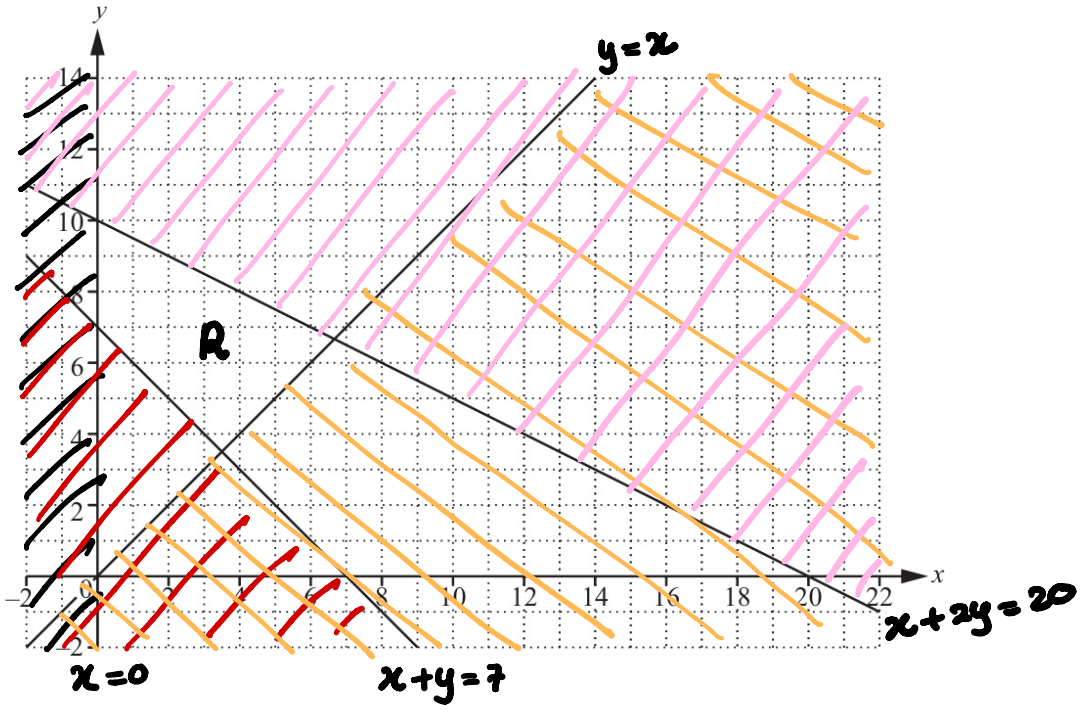
Question 2



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$y \leqslant 2$ $y \geqslant 1$ $y \leqslant 2x - 1$ $y \leqslant 5 - x$ [3]

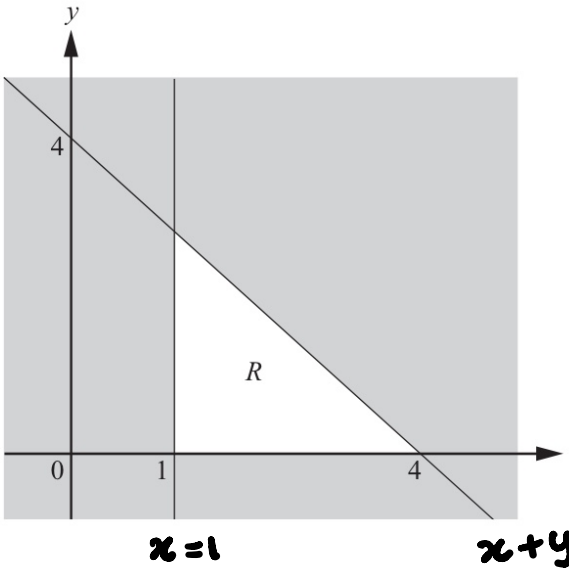
Question 3



By shading the unwanted regions of the grid above, find and label the region R that satisfies the following four inequalities.

$x \geqslant 0$ $x + y \geqslant 7$ $y \geqslant x$ $x + 2y \leqslant 20$ [3]

Question 4



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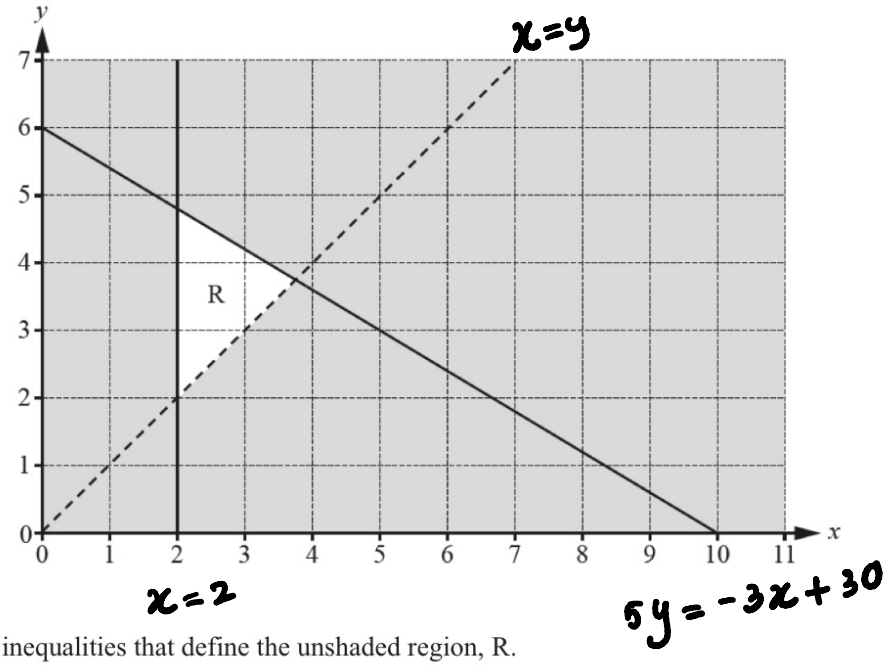
Write down the three inequalities that define the unshaded region, R. [4]

$y \geqslant 0$ $x + y \leqslant 4$

$x \geqslant 1$

Question 5



Find the three inequalities that define the unshaded region, R. [5]

$y > x$

$x \geqslant 2$

$5y \leqslant -3x + 30$